MSc Thesis: Extending an SDN-based Network Policy Framework

During the last year DTU-Fotonik has developed a Network Policy Framework (NPF) [1] for the ONOS SDN controller [2]. This framework is a standalone ONOS application and its role is to facilitate the management of a network infrastructure, by means of well-defined and generic policies. The NPF receives policy requests through a dedicated REST API and then proceeds to validate them internally. If a policy request is successfully validated (e.g. does not collide with other policies and it can be enforced in the current network state), then the NPF proceeds to enforce it in the network infrastructure (e.g. by installing flow rules in the network via OpenFlow messages).

However at this stage interacting with the NPF is a relatively cumbersome task, as it implies the composition of JSON requests to the NPF for each and every interaction. One of the tasks for this project is to develop a web-based dashboard for the NPF, which will serve two main functionalities:

1. Serve as a hub for monitoring the status of all policies within the NPF. Some examples of monitoring “points” are: The type of a policy, the status of a policy etc.
2. Act as an alternative means of interacting with the NPF. This means that through the dashboard, an administrator should be able to perform any action that is open through the REST API.
3. In this way, interacting with the NPF will be faster and more user-friendly. Ideally this project should be developed as an extension to the existing ONOS GUI and not as a standalone project, hence facilitating possible Open Source contributions to ONOS later on. Finally and since the NPF is still an ongoing project, the design of the dashboard should be as extensible and modular as possible.

The second major task of this project will be to further enhance the set of policy types supported by the NPF. At the moment two policy types are fully implemented (Connectivity and Firewall), but the plan is to create a more diverse set of policy types. Designing and developing the policy will be the responsibility of the student, but the policy should meet the following criteria:

- It must be technology agnostic (i.e. Not tied to specific hardware and protocols).
- It must be “useful” within the context of a Data-center/cloud environment.
- It must be compliant with the workflows of the NPF.
- It must NOT rely on 3rd party technologies (e.g. External databases to ONOS)

Requirements:
- Basic hands-on programming experience in Java
- Basic knowledge of SDN concepts and protocols (i.e. REST, OpenFlow).
- Basic hands-on experience with the ONOS SDN controller.
- Basic knowledge of web development is an advantage.

Practical details: 30-35 ECTS, 1 student
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References: